

Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

**• • R E M A R K S / A R G U M E N T S • •**

The Office Action of November 17, 2005 has been thoroughly studied. Accordingly, the changes presented herein for the claims, considered together with the following remarks, are believed to be sufficient to place the application into condition for allowance.

By the present amendment independent claim 1 has been changed to recite that the hydrogenated nitrile rubber composition has a Mooney viscosity  $ML_{1+4}(100^{\circ}C)$  of 70 to 50.

Support for this limitation can readily be found in the first full paragraph on page 3 of applicant's original specification.

Also by the present amendment, the phrase "at least 30%" in claim 1 has been changed to "at least 30 wt.%". Support for this limitation is discussed in detail below.

Entry of the change to independent claim 1 is respectfully requested.

Claims 1-9 are pending in this application.

Claim 1 stands rejected under 35 U.S.C. §112, second paragraph. Under this rejection the Examiner has taken the position that the recitation "at least 30%" in claim 1 renders the claim indefinite, because there is no base to cite the percentage.

Applicant notes that the bound acrylnitrile [AN] content is well known to those skilled in the art as being a weight percent of the copolymerized AN in acrylnitrile-butadiene rubber. As evidence thereof, it is noted that the symbol "wt.%" is used in the section of "acrylnitrile-butadiene rubber" in

Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

the right column at page 3 of the attached "Dictionary of Rubber Technology (in Japanese)" (submitted as Exhibit A).

In particular, applicant notes that the Patent Abstracts of Japan which the Examiner relies upon (the Seiji et al. reference) states on the first page under the "*Solution*" section "...the hydrogenated nitrile rubber having a binding acrylonitrile content of 38% or more..."

The Examiner should note that this passage did not specifically state that the percentage of the binding acrylonitrile content was by weight percent. Such an explicit reference to weight percent was not necessary, because by convention, those skilled in the art understand the percent basis that is inferred.

Accordingly, it is submitted that those skilled in the art reading applicant's disclosure would understand that the term "at least 30%" in claim 1 refers to "wt.%."

It is noted that claim 1 has been amended to recite "at least 30 wt.%" to satisfy the Examiner's concerns.

Claims 1, 2 and 4-9 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,978,409 to Fujiwara et al.

Claims 1-9 stand rejected under 35 U.S.C. §102(b) as being anticipated by Japanese Published Application No. 2002-080639 to Seiji et al.

For the reasons set forth below, it is submitted that all of the pending claims are allowable over the prior art relied upon by the Examiner and therefore, each of the outstanding prior art rejections of the claims should properly be withdrawn.

Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

Favorable reconsideration by the Examiner is earnestly solicited.

The Examiner has relied upon Fujiwara et al. as disclosing:

...a hydrogenated nitrile rubber composition comprising (A) treating fibers with an activating agent, (B) dipping the fibers into a resorcinol/formalin/latex solution, (C) treating the fibers with an adhesive composition, and (D) placing the fibers in close contact with a hydrogenated nitrile rubber, and (E) vulcanizing the rubber together with the fibers, wherein the fibers are carbon fibers (claims 1 and 7). Attention is drawn to Example 1, wherein the composition comprises 10% of hydrogenated nitrile rubber (Zetpol 2020) and further comprises 5% of carbon black. Thus, the present claims are anticipated by the disclosure of Fujikara et al.

Whereas the present invention is directed to a hydrogenated nitrile rubber composition suitable for use as a molding material for sealing members, Fujiwara et al. is directed to a method of bonding fibers to hydrogenated nitrile rubber. These differences, it will be shown, result in differences which distinguishing applicant's claimed composition over the teachings of Fujiwara et al.

Applicant's independent claim 1 recites:

A hydrogenated nitrile rubber composition which comprises 100 parts by weight of hydrogenated nitrile rubber with a bound acrylonitrile content of at least 30 wt.%, a Mooney viscosity  $ML_{1+4}$  (100°C) of 70 to 50 (median value) and an iodine number of 28 or less (median value) and 65 to 200 parts by weight of carbon fibers.

The Examiner has relied upon Fujiwara et al. as disclosing:

(A) treating [carbon] fibers with an activating agent, (B) dipping the fibers into a resorcinol/formalin/latex solution, (C) treating the fibers with an adhesive composition, and (D) placing the fibers in close contact with a hydrogenated nitrile rubber, and (E) vulcanizing the rubber together with the fibers.

Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

In actuality, Fuijkara et al. teach:

...the first step of treating fibers with an activating agent selected from the group consisting of polyisocyanates, epoxy compounds and silane coupling agents; the second step of dipping the fibers into a resorcinol/formalin/latex solution; the third step of treating the fibers with an adhesive composition which comprises (a) 1-90% by weight of polymers, based on the composition, the polymers containing halogens in amounts of 25-70% by weight based on the polymers, and (b) 10-99% by weight of polyisocyanates, aromatic polynitroso compounds or polyepoxy compounds; and the fourth step of placing the fibers in close contact with hydrogenated nitrile rubber and vulcanizing the rubber together with the fibers.

As can be seen, the fibers themselves are coated/treated with:

- 1) one of polyisocyanates, epoxy compounds and silane coupling agents;
  - 2) a solution of resorcinol/formalin/latex solution; and
  - 3) an adhesive composition which comprises (a) 1-90% by weight of polymers, based on the composition, the polymers containing halogens in amounts of 25-70% by weight based on the polymers, and (b) 10-99% by weight of polyisocyanates, aromatic polynitroso compounds or polyepoxy compounds,
- before the fibers are ever contacted with the hydrogenated nitrile rubber.

Moreover, Fuijkara et al. teaches that the resulting compositions have large strengths and high resistances to fatigue from repeated flexure.

As can be appreciated, the "treated" fibers have a unique composition, before being combined with the hydrogenated nitrile rubber and then vulcanized.

Appl. No. 10/524,628  
Amtd. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

The Examiner has relied upon Example 1 of Fujikara et al. as teaching a composition that comprises 10% of hydrogenated nitrile rubber (Zetpol 2020) and further comprises 5% of carbon black.

With regard to Example 1, it is noted that Fujikara et al. teaches dipping polyamide fibers in a 5% aqueous solution of water soluble epoxy resin and then dipping the polyamide fibers into a resorcinol/formalin/latex solution. Afterward, the polyamide fibers were dipped into adhesive compositions W, X, Y and Z, respectively.

As shown in Table 1, adhesive composition Z comprises 10% nitrile rubber, 5% carbon black, and 85% toluene.

However, it is noted that carbon black is not mixed into, i.e. is not a component/ingredient of, the rubber, but is actually a component/ingredient of the adhesive.

Moreover, it is noted that Fujikara et al. use Zetpol 202.

Attached as Exhibit B is a product specification for Zetpol 2020 which shows that the Mooney viscosity of Zetpol 2020 is 78.

Applicant's independent claim limits the Mooney viscosity from 70 to 50. This range is disclosed as a preferred range in applicant's specification, which produces a composition that has desired kneadability and moldability characteristics which allow the composition to be formed into cross-linked sealing members having a high wear resistance suitable for sealing a fluid, for example, a liquid such as engine oil, gear oil, transmission oil, water, an aqueous liquid containing water as the main component such as a long life coolant, etc., or a gas such as a cooling medium such as flon,

No. 10/524,628

Dated March 13, 2006

by Office Action of November 17, 2005

carbon dioxide, etc., natural gas, nitrogen, hydrogen, etc., under sever conditions of high temperatures, high pressure, high speeds, etc. and also showing such performances as not to lower mechanical and physical properties even under high temperature conditions due to heat generation by sliding, etc.

The Mooney viscosity limitation of 70 is demonstrated in applicant's Example 1.

Fujiwara et al. does not anticipate applicant's invention as presently set forth in independent claim 1.

The Examiner has relied upon Seiji et al. as disclosing:

....a hydrogenated nitrile rubber composition for molding material for a high pressure sealant, comprising about 30-100 parts by weight carbon black, about 10-60 parts by weight of graphite, and about 5-60 parts by weight of carbon fiber (claim 3). Attention is drawn to paragraph [0028], wherein the hydrogenated nitrile rubber has 44.2% of bound acrylonitrile; iodine number 24; and Mooney viscosity of 78. Thus, the present claims are anticipated by the disclosure of Seiji et al.

Initially it is noted that applicant's independent claim 1 limits the amount of carbon fibers to 65 to 200 parts by weight.

Such a high filling ratio of carbon fibers, which improves wear resistance (as disclosed by applicant) is possible because of the use of a hydrogenated nitrile rubber having a Mooney viscosity within applicant's disclosed and claimed range.

Seiji et al. limits the Mooney viscosity in each of the examples to 85.

This Mooney viscosity accordingly limited the filling ratio of carbon fibers in Seiji et al.

Applicant's independent claim 1 recites a Mooney viscosity of 70 to 50.

Appl. No. 10/524,628  
Amdt Dated March 13, 2006  
Reply to Office Action of November 17, 2005

Such a Mooney viscosity range is not provided by Seiji et al.

Accordingly, Seiji et al. does not anticipate applicant's claimed invention.

Moreover, as noted above, applicant's recited Mooney viscosity range allows for a higher carbon fiber filler ratio than the Mooney viscosity of Seiji et al.

Therefore, Seiji et al. does not even appreciate or foresee the improvements in wear resistance that is achievable according to the present invention (being related to carbon fiber loading).

The Examiner's attention is directed to applicant's Comparative Example 2 in which a hydrogenated nitrile rubber having a Mooney viscosity of 85 (comparable to Seiji et al.) was used in comparison to Example 1 in which a hydrogenated nitrile rubber having a Mooney viscosity of 65. As can be seen in the Table on page 8 of applicant's specification, there is a significant improvement/advantage to using a hydrogenated nitrile rubber having a lower Mooney viscosity -- which Seiji et al. does not suggest or appreciate.

The Examiner has relied upon paragraph [0028] in Seiji et al. This paragraph refers to Comparison Example 3.

It is noted that in Comparison Example 3 no carbon fiber is used. Only graphite is included and then only at 60 parts by weight.

Accordingly, Comparison Example 3 and paragraph [0028] are not deemed relevant to applicant's claimed invention.

Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

Based upon the above distinctions between the prior art relied upon by the Examiner and the present invention, and the overall teachings of prior art, properly considered as a whole, it is respectfully submitted that the Examiner cannot rely upon the prior art as required under 35 U.S.C. §102 as anticipating applicants' claimed invention.

It is, therefore, submitted that any reliance upon prior art would be improper inasmuch as the prior art does not remotely anticipate, teach, suggest or render obvious the present invention.

It is submitted that the claims, as now amended, and the discussion contained herein clearly show that the claimed invention is novel and neither anticipated nor obvious over the teachings of the prior art and the outstanding rejection of the claims should hence be withdrawn.

Therefore, reconsideration and withdrawal of the outstanding rejection of the claims and an early allowance of the claims is believed to be in order.

It is believed that the above represents a complete response to the Official Action and reconsideration is requested.

If upon consideration of the above, the Examiner should feel that there remains outstanding issues in the present application that could be resolved, the Examiner is invited to contact applicants' patent counsel at the telephone number given below to discuss such issues.

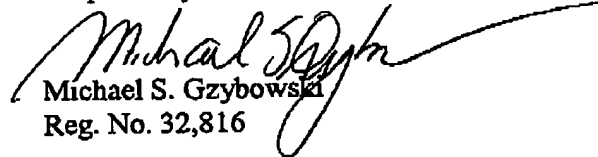
To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of



Appl. No. 10/524,628  
Amdt. Dated March 13, 2006  
Reply to Office Action of November 17, 2005

time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,

  
Michael S. Gzybowski  
Reg. No. 32,816

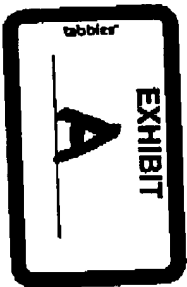
BUTZEL LONG  
350 South Main Street  
Suite 300  
Ann Arbor, Michigan 48104  
(734) 995-3110

145955.1

# ゴム用語辞典

Dictionary of Rubber Technology

日本ゴム協会



REST AVAILABLE COPY

ゴム用語辞典 本体価格 4,500円

1997年9月30日 初版発行

編集者 監訳 日本ゴム協会出版企画委員会

〒107 東京都港区元赤坂1丁目5番26号

印刷者 小宮山印刷工業株式会社

〒102 東京都新宿区大塚町12番地

発行者 監訳 日本ゴム協会

〒107 東京都港区元赤坂1丁目5番26号  
電話 (03)3401-2956 Fax. (03)3401-4143



# ZEON

## ZEON CORPORATION

Home | Site Map | Search for

Press Release

Japanese

Welcome to ZEON

Business and Products

R&D

Investor Relations

Environment and Safety

Our Affiliates

Office Plant Loc

Home >> Business and Products >> Business >> Synthetic Rubber Products, etc >> Zetpol HNBR

### Synthetic Rubbers Product List

Download Catalogs and Technical Documents



Contact

#### Zetpol (HNBR)

[Very High Nitrile HNBR >>](#)

[High Nitrile HNBR >>](#)

[Middle/High Nitrile HNBR >>](#)

[Low Temperature Grade HNBR >>](#)

[Zetpol Polyblend \(HNBR/PVC\) >>](#)

#### Very High Nitrile HNBR

Grade	Bonded ACN (%)	Iodine value (mg/100mg)	Mooney viscosity (ML+4 at 100°C)	Specific gravity	Characteristics and applications
Zetpol 0020	49.2	23	65	1.00	Maximum fuel and solvent resistance. Excellent performance in hex fuel and MTBE. Suitable for sulfur and peroxide curing.

>> [PAGE TOP](#)

#### High Nitrile HNBR

Grade	Bonded ACN (%)	Iodine value (mg/100mg)	Mooney viscosity (ML+4 at 100°C)	Specific gravity	Characteristics and applications
Zetpol 1000L	44.2	<7	70	0.98	Fuel resistant hoses, diaphragm and seals. Automotive and industrial refrigerant applications. Excellent heat resistance, oil resistance and processability. Suitable for peroxide curing.
Zetpol 1010	44.2	10	85	0.98	Fuel resistant hoses, diaphragms and seals. Automotive and industrial refrigerant applications. FDA approved. Suitable for peroxide curing.
Zetpol 1020	44.2	24	78	0.98	Same as Zetpol 1010, except for a lower saturation level allowing for a sulfur curing. Suitable for sulfur and peroxide curing.

>> [PAGE TOP](#)

#### Middle High Nitrile HNBR

Grade	Bonded ACN (%)	Iodine value (mg/100mg)	Mooney viscosity (ML+4 at 110°C)	Specific gravity	Characteristics and applications
Zetpol 2000	36.2	<7	85	0.95	For O-rings, gaskets, seals, or oil field components. Requiring the best balance of heat and ozone resistance. Suitable for peroxide curing.
Zetpol 2000L	36.2	<7	65	0.95	Low Mooney version of Zetpol 2000. Excellent for transfer or injection molding. Suitable for peroxide curing.

[Synthetic Rubber Product List](#)

[Nipol SBR](#)

[Nipol SBR NS Series](#)

[Nipol BR](#)

[Nipol IR](#)

[Nipol HS](#)

[Nipol NBR](#)

[Nipol POLY](#)

[Nipol AR](#)

[Zetco: HNBR](#)

[ZSC](#)

[Geckron: Hydrex \(Epichlorohydrin Polymers\)](#)

[Synthetic Rubber Product Topic](#)



2006/01/13

[http://www.zeon.co.jp/business\\_e/enterprise/rubber/rubber\\_hnbr.html](http://www.zeon.co.jp/business_e/enterprise/rubber/rubber_hnbr.html)

Zetpol 2010	36.2	11	85	0.93	For O-rings, gaskets, seals or oil field components. Requiring the best balance of heat and compression set. Suitable for peroxide curing.
Zetpol 2010L	36.2	11	57.5	0.95	Low Mooney version of Zetpol 2010. Excellent for transfer or injection molding. Suitable for peroxide curing.
Zetpol 2010H	36.2	11	>120	0.95	High Mooney version of Zetpol 2010. Offers excellent compression set and abrasion resistance. Suitable for peroxide curing.
Zetpol 2011	36.2	18	80	0.95	For seals, belts and oil field components. Providing excellent balance between static heat resistance, ozone resistance and dynamic hysteresis. Suitable for sulfur curing.
Zetpol 2020	36.2	28	78	0.95	For seals, belts and oil field components. Providing excellent balance between static heat resistance and dynamic hysteresis. Suitable for sulfur and peroxide curing.
Zetpol 2020L	36.2	28	57.5	0.95	Low Mooney version of Zetpol 2020. Excellent for transfer or injection molding. Suitable for sulfur and peroxide curing.
Zetpol 2030L	36.2	56	57.5	0.95	HNBR with highest level of unsaturation available. Providing excellent dynamic properties. Especially suited for rolls and dynamic oil field components. Suitable for sulfur curing.

>> PAGE TOP

#### Low Temperature Grade HNBR

Grade	Hardness ACN (%)	Indide value (mg/100mg)	Mooney viscosity (ML1+A at 100°C)	Specific gravity	Characteristics and applications
Zetpol 3300	23.6	< 7	80	0.97	Improved low temperature TR10 of -34°C. Providing a good balance of oil and low temperature resistance plus improved high temperature capabilities. Suitable for peroxide curing.
Zetpol 3310	23.6	15	80	0.97	
Zetpol 4300	18.6	< 7	80	0.98	Improved low temperature TR10 of -37°C providing good heat and oil resistance. Very good for arctic oil and gas drilling applications as well as automotive uses. Suitable for peroxide curing.
Zetpol 4310	18.6	15	80	0.98	
Zetpol 4320	18.6	27	70	0.98	Improved low temperature TR10 of -37°C providing good heat and oil resistance. Very good for arctic oil and gas drilling applications as well as automotive uses. Suitable for sulfur and peroxide curing.

>> PAGE TOP

#### Zetpol Polyblend (HNBR/PVC)

Grade	Hardness ACN (%)	Indide value (mg/100mg)	Mooney viscosity (MS1+A at 100°C)	Specific gravity	Characteristics and applications
Zetpol PBZ 123	44.2*	24*	81	1.08	Zetpol 1020 blended with PVC to provide an ideal material for fuel hoses and diaphragms. Suitable for sulfur and peroxide curing.

\*Value of base Zetpol